

Naofumi KITAGAWA\* & Tsutomu KODAMA\*\*: A remarkable  
new species of *Bazzania* (Hepaticae)  
with endogenous gemmae

北川尚史\*・児玉 務\*\*: 内生無性芽をもつムチゴケ属  
(苔類) の注目すべき一新種

In the collections of bryophytes from North Borneo made by the Osaka City University Expedition (1968-69) and by the junior author (1970), we have found a remarkable species of *Bazzania* which is best characterized by the endogenous gemmae. Each leaf- and underleaf-cell contains a large, unicellular gemma and, in correlation with this feature, the leaf is strongly caducous. This kind of gemmae occurs very rarely in the Hepaticae.

***Bazzania kokawana*** N. Kitagawa et T. Kodama, sp. nov. (Fig. 1)

Species insignis bene distincta nec a speciebus *Bazzaniae* et a eis ceterarum generum hepaticarum; gemmis endogenis, unicellularibus praesentibus singulariter in omni cellula folii.

Plants small, fragile, pale olive-green and somewhat frosty, prostrate and closely adhering to substrata, 0.8-1.2 mm wide, up to 7 mm long. Stems pale olive-green to brownish, 100-150 $\mu$  thick, cortical cells 15-35 $\times$ 15-20 $\mu$ , thick-walled; terminal branching very rare, intercalary branches rather frequent, mostly flagelliform but sometimes becoming normal leafy shoots; rhizoids rather numerous on flagella, hyaline. Leaves strongly caducous, rather densely imbricate, spreading at nearly right angles, hardly deflexed even in drying, ovate, 500-600 $\mu$  long, 370-420 $\mu$  wide, shortly and subtransversely inserted; the apex variable, obtuse, rounded, obliquely truncate or retuse but never distinctly toothed; the margin minutely crenulate with slightly projecting marginal cells, the antical margin slightly reflexed, arched with a somewhat dilated base. Leaf-cells large, rather transparent, each containing a single large gemma, 20-36 $\times$ 18-28 $\mu$  (cell-size is relatively

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uniform throughout leaf); trigones rather small, acute; cuticle distinctly verruculose to striolate. Underleaves imbricate to approximate, orbicular-quadrate to subreniform,  $150\text{--}250\mu$  long,  $200\text{--}400\mu$  wide, shallowly bilobed, the lateral margin on both sides often with an obtuse angulation; cells similar to those of leaves and gemmiparous. Plants dioicous, gynoecia on underleaf-axils of normal leafy shoots or on flagella; bracts hyaline, bilobed, with crenulate-ciliate margins; perianth fusiform, ca. 2 mm long, gradually contracted to the mouth, bistratose below. Gemmae constantly unicellular, quadrate-orbicular to oblong-elliptical in outline and variously angulate,  $20\text{--}35\times 17\text{--}27\mu$  ( $8.5\text{--}11.5\mu$  high), with smooth cuticle.

Specimens examined. Sabah (North Borneo). Kinabalu National Park :

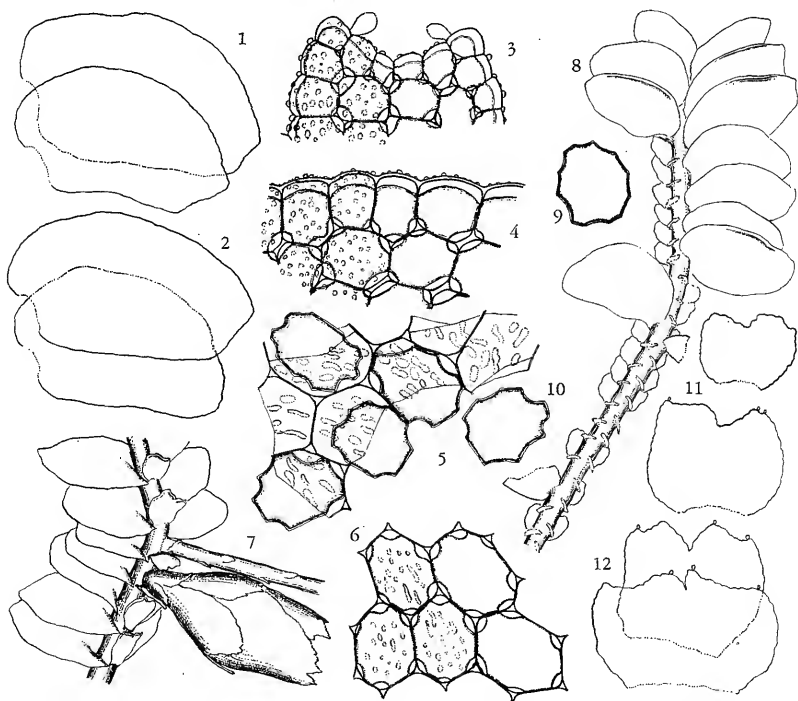


Fig. 1. *Bazzania kokawana*. 1-2. Leaves,  $\times 50$ . 3. Cells of underleaf-lobe,  $\times 200$ . 4. Cells of leaf-margin,  $\times 450$ . 5. Cells of fragmented leaf,  $\times 450$ . 6. Cells of leaf-middle,  $\times 450$ . 7. Part of a shoot, with a young gynoecium,  $\times 30$ . 8. Part of a shoot,  $\times 30$ . 9-10. Gemmae,  $\times 450$ . 11-12. Underleaves,  $\times 75$ . All drawn from the type.

Mamut ridge, west of Mamut Camp, 1500-1800 m alt., on tree trunk, S. Kokawa & M. Hotta 5937 (type), in herb. Osaka Museum of Natural History, duplicates in KYO, NICH; near Mamut Mine, ca. 1300 m alt., on tree trunk, T. Kodama 40983.

The gemmae of *Bazzania kokawana* are formed in all cells of leaves and underleaves but not in those of other portions (stems, bracts, perianths, etc.). They are developed when leaves are still young and thus every cell of the leaf near the shoot apex contains a fully developed gemma. In the leaf at the shoot apex (the uppermost leaf of fig. 8), cells of the distal portion contain gemmae which already possess their own cell-walls, but those of the proximal portion have cytoplasm which detaches itself from the wall at the corner of the mother cell—they seem to be under formation of gemmae. In the younger leaf hidden by the underleaf, this plasmolysis-like figure is seen in the cells of the distal and middle portions but the basal cells are still embryonic (these are recognized even in dried material).

The gemmae are closely packed in the leaf-cells but variously concave at their corners. Thus, adjoining cells form there an empty space which is hyaline and looks just like a nodulose trigone of the cell-walls.

Endogenous gemmae are known only in a few genera of the Hepaticae. *Solenostoma caespiticiu*m is only other representative in Jungermanniales that possesses such gemmae. The gemma formation of this species is, however, quite different from that of *Bazzania kokawana*; the gemmae of the former species occur in the embryonic tissue of the swollen apex of the shoot and several (2-4) gemmae are formed in each mother cell (Buch, 1911). *Riccardia* (Metzgeriales) has also endogenous gemmae; they are 2-celled and occur singly in an epidermal cell of thallus and escape by rupture of the outer wall of the mother cell (Goebel, 1930). Also in *Metzgeria*, a genus related to *Riccardia*, endogenous gemmae are formed but they germinate in situ and develop into young thalli (adventitious shoots).

We have described another curious type of gemmae in a Bornean species of *Acromastigum*; they are filamentous, sometimes forked and looking like an alga (Kitagawa & Kodama 1974). Although any kind of gemmae had not been known previously in the family Lepidoziaceae (except by a few early dubious reports), we have now recognized there two types of gemmae, both of which are unique in the Hepaticae. It is also remarkable

that such diverse types of gemmae occur in a single family—this is the case rarely found in the Hepaticae.

The present species is also characterized by other features. The furcate terminal branching, one of the common characters of *Bazzania*, is very rare and instead the intercalary branches sometimes develop into normal leafy shoots. The leaf is also unusual in the genus; it is subentire (not dentate nor serrulate), and its insertion line is subtransverse and rather short (this feature is probably correlated with its caducous nature).

#### Literature cited

Buch, H. 1911. Ueber die Brutorgane der Lebermoose, pp. 1-69, pls. 1-3, Helsingfors. Goebel, K. 1930. Organographie der Pflanzen, 3-Aufl., II, pp. i-x, 643-1378, Jena. Kitagawa, N. & Kodama, T. 1974. A remarkable new species of *Acromastigum* (Hepaticae) with septate rhizoids and filamentous gemmae. The Bryologist 77(1): 57-62.

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大阪市大の調査隊および筆者の一人(児玉)によって北ボルネオで採集された苔類コレクションに基づき、きわめて興味深いムチゴケ属の新種が記載された。本種の葉および腹葉の各細胞は1個の単細胞性の内生無性芽を備えている。無性芽は母細胞の角隅で凹んであたかもトリゴン状を呈するが、他の部分では母細胞の細胞膜に密着している。葉は脱落性が強く、たやすくばらばらに壊れて無性芽を放出する。この無性芽はごく若い葉で形成され、シュートの先端に近い葉においても、そのすべての細胞は既に無性芽を含んでいる。内生無性芽は苔類ではきわめて稀で、茎葉性の苔類(Jungermanniales)では従来 *Solenostoma caespiticium* で知られていたにすぎない。しかし、その無性芽は球状にふくれた特殊なシュートの先端に生じること、および1個の母細胞中に数個形成されることで本新種の無性芽と異なっている。葉状性の苔類(Metzgeriales)では *Riccardia* および *Metzgeria* で内生無性芽が知られているが、前者は2細胞性であり、後者は母細胞中で発芽し、その場で葉状体を形成する。私達は先に同じコレクションに基づく *Acromastigum* の新種において、糸状の無性芽を報告した。この *Acromastigum* および本論文の *Bazzania* の無性芽は両者が属すムチゴケ科はもちろん(この科ではいかなる型の無性芽に関しても確実な記録はなかった)、苔類全体でも他に類のない特異なものである。また、両属の無性芽のようにまったく異なる型が同一の科の中に生じることが苔類ではごく稀である。

おわりに、貴重な資料を提供していただいた瀬戸剛氏(大阪市立自然史博物館)および採集者の粉川昭平博士(大阪市大)と堀田満博士(京大)にお礼を申し上げたい。